

## Hematological and lipid profile analysis of the petrol pump workers in Dehradun region

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### Abstract

The effect of gasoline fumes on the health status of petrol pump workers having experience between 5-10 years has been investigated and the results are compared with the non petrol pumps. Petrol pump workers are exposed to many toxic substances present in their work places. The most dangerous effect is due to benzene which is mostly found in gasoline vapours. The blood samples of fifty controls (unexposed to petroleum fume exposed subjects) were analyzed and are compared to fifty petroleum workers with 6 to 10 years of experience. Data pertaining to different parameters of hematological profile and lipid profile were analyzed. The aim of the study is to assess the hematological and lipid profile of petrol pump workers in Dehradun region. The study was to ascertain whether the exposure to petrol fumes has any significant bearing on their blood parameters or not. The data was analyzed applying one way ANOVA Technique. The Statistical Package Genstat-32 was used for the analysis purpose. The findings of the analyses showing parameters like mean values, the level of significance and values of critical difference were studied.

**Keywords:** Hematological profile, Lipid profile, ANOVA Technique, Petrol pump workers

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## Introduction

The use of biological fuel fumes in petroleum industries can cause adverse effect on users under petroleum industries and workers of petrol pump. The data available on the toxicokinetic study shows that many compounds such as benzene, toluene and xylene can be observed more rapidly through air. Respiratory exposure to petrol has been associated with skin allergies, central nervous system, depression, respiratory disorder apart from various other diseases. Benzene is a primary component in extraction of crude oil and natural gas but it is toxic to both body and its organs [1]. Benzene, major part of gasoline exposure leads to neutrophils changes, thrombocytopenia and lymphocytopenia [2]. Earlier research studies which were carried out were based on composite fumes evaporating from petroleum products which were experimented on animals. Highly reactive elements like benzene, lead, nitrates are known to produce harmful effects on bone marrow hypoplasia, human tissues, healthy blood cells etc. [3].

It is a well known fact that petrol pump workers are exposed to many toxic gases which contain benzene and mostly found in petrol vapours [4]. There was biochemical evidence of impaired renal function [5]. It was suggested in the earlier studies that inhalation of fumes of gasoline causes a significant increase in serum triglycerides, lipoprotein with low density and there is a significant decrease in the lipoprotein of high density. High chances of cancer, DNA damage, chromosomal damage, leukemia and anemia etc [6]. Benzene cause oxidative stress, disruption of cell damage, programmed cell death [7,8]. Chronic exposure to benzene can result in hematotoxic and hepatotoxic and can affect the tissue or blood cells [9]. P-450 is responsible for oxidation of benzene and form oxygen free radicals [10,11,12]. Atherosclerosis is caused due to low level of high density lipoprotein, LDL, high level of total cholesterol and triglycerides in plasma [13,14]. At minimum dosages, fuel fumes aggravating in the eyes, respiratory tract and skin. Introduction at higher fumes groupings could turn out impacts like stunned stride, thick discourse and perplexity. Exceptionally high fixations may bring about quick obviousness and passing because of respiratory disappointment [15].

The objective of the present research is to investigate on hematological profile and lipid profile analysis of the petrol pump workers in Dehradun region. The effect of gasoline fumes on the

health status of petrol pump workers having experience between 5-10 years has been studied and the results are compared with the non petrol pump workers in order to understand the actual effect of gasoline fumes on the health of the petrol pump workers.

### **Material and methods**

Fifty petroleum workers were included in the study. A total of 50 petrol pump workers, non-smoking (working as petrol or diesel filling workers for 5 to 10 years, at least 8 hrs/day), in the age group of 25-45 years, gender, height and weight.s were considered for this study. The petrol pump workers were matched with 50 non smokers. All subjects had invited and had volunteered to participate in the study and written informed consent was obtained. Venous blood is collected from a vein in the arm with a needle and syringes. The blood samples of fifty controls (unexposed to petroleum fume exposed subjects) were analyzed and are compared to fifty petroleum workers with 6 to 10 years of experience. None of the workers were overweight and obese. All are non diabetic and there TSH level were normal and none of them was hypertensive. Data pertaining to different parameters of (i) Hematological Profile (ii) Lipid profile parameters were recorded. The aim was to ascertain whether the exposure to petrol fumes has any significant bearing on their blood parameters or not. The data was analyzed applying one way ANOVA Technique. The Statistical Package Genstat -32 was used. The findings of the analyses have been tabulated below showing parameters, mean values, the level of significance and values of critical difference (CD). The respective interpretations with graphical representation have also been given.

### **Results and discussion**

The mean value of age of control group is insignificantly low as compared to exposed group. This is because the subjects were selected such that age of the control group should match with the other group. The reason for this kind of selection is that age also affects all the parameters in the study and age matched control with exposed group minimizes the effect of the age.

Table 1: Comparison of Age of control and petrol pump workers with 6-10 years experience

| Conditions | Mean values of Age |         | Significance | CD |
|------------|--------------------|---------|--------------|----|
|            | Control            | Exposed |              |    |
|            | 31.92              | 32.48   | NS           | -- |

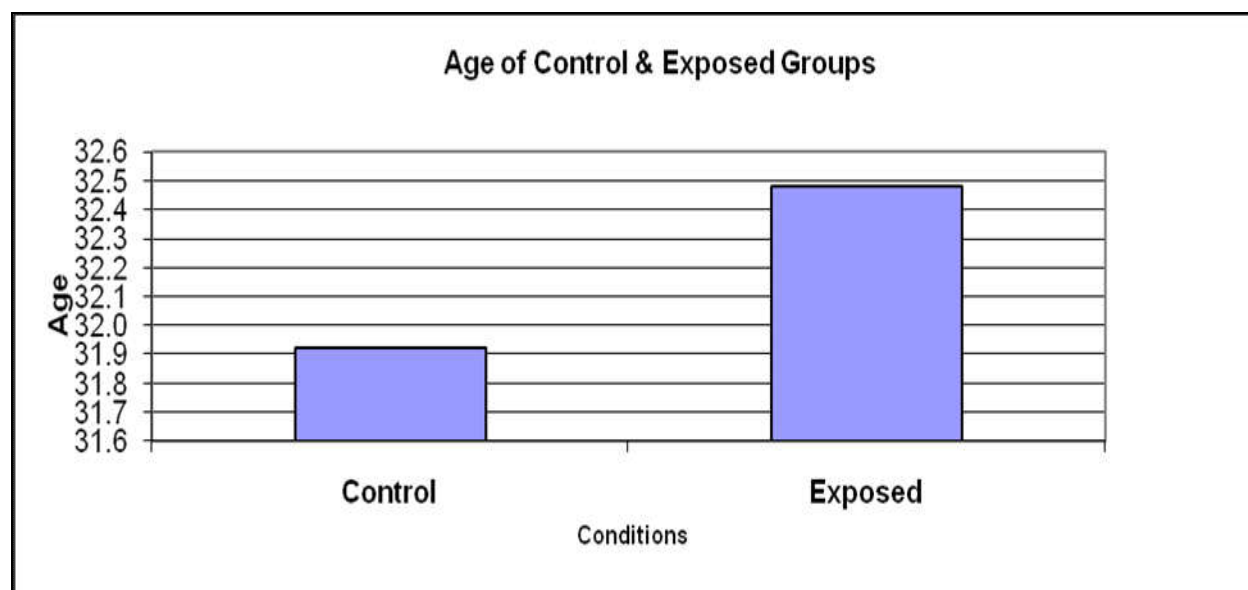


Fig.1. Comparison of Age of control and petrol pump workers with 6-10 years experience

The BMI (Body Mass Index) of the control group was significantly high as compared to petrol pump workers. The BMI of both the groups is normal as overweight and obese subjects were not included in the study to nullify the effect of BMI in the observed parameters.

### BMI (Body Mass Index)

**Table 2: Comparison of BMI of control and petrol pump workers with 6-10 years experience**

| Conditions | Mean values of BMI |         | Significance       | CD    |
|------------|--------------------|---------|--------------------|-------|
|            | Control            | Exposed |                    |       |
|            | 28.15              | 21.43   | ***<br>(p < 0.001) | 1.503 |

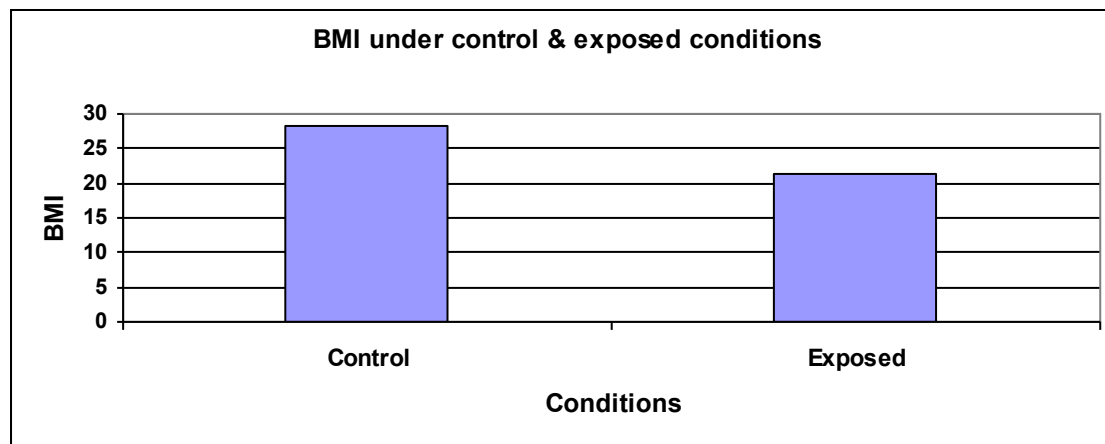


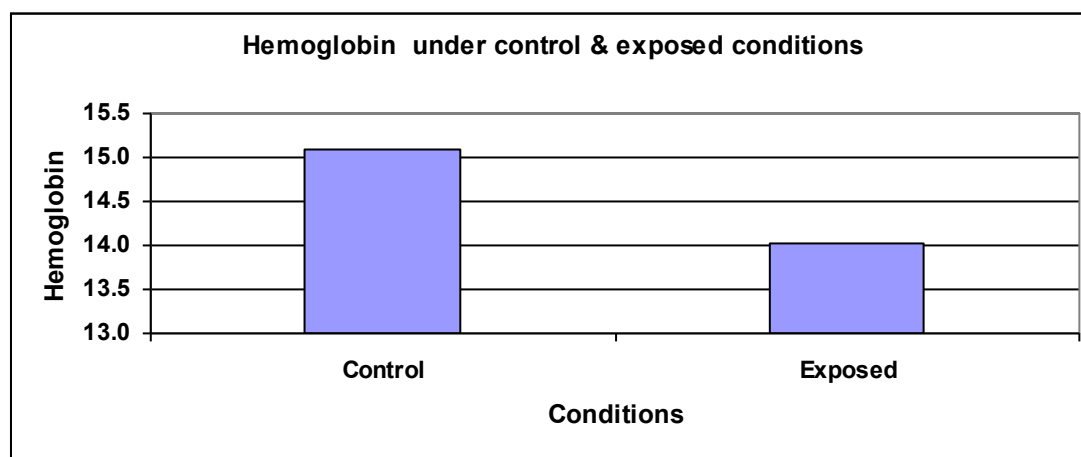
Figure 2: Comparison of BMI of control and petrol pump workers with 6-10 years experience

### Hematological Parameters:

Table: 3 Comparison of Hematological profile of control and petrol pump workers with 6-10 years experience.

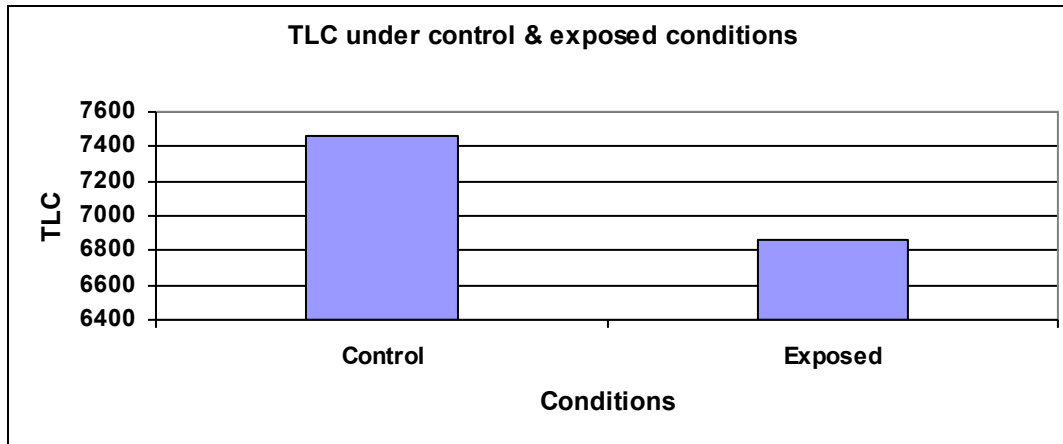
| PARAMETERS                                | CONTROL | EXPOSED | LEVEL OF SIGNIFICANCE | CD     |
|---|---------|---------|-----------------------|--------|
| Hemoglobin (gm/dl)                        | 15.09   | 14.02   | *** (p < 0.001)       | 0.535  |
| TLC/mm <sup>3</sup>                       | 7456    | 6856    | NS                    | -      |
| Lymphocytes%                              | 33.32   | 34.32   | NS                    | -      |
| Neutrophils %                             | 57.06   | 57.36   | NS                    | -      |
| Eosinophils%                              | 3.90    | 3.74    | NS                    | -      |
| Monocytes%                                | 5.14    | 4.84    | NS                    | -      |
| Total RBC Count million / mm <sup>3</sup> | 5.103   | 4.713   | ***(p < 0.001)        | 0.2192 |
| PCV%                                      | 43.35   | 41.67   | *(p < 0.05)           | 1.338  |
| MCV(Fl)                                   | 86.45   | 3.90    | NS                    | -      |
| MCH(Pg)                                   | 30.36   | 29.45   | NS                    | -      |
| MCHC(gm/dl)                               | 34.50   | 33.08   | ***(p < 0.001)        | 0.684  |
| Platelets                                 | 2.736   | 2.352   | ** (p < 0.01)         | 0.260  |

**Hemoglobin:** The level of hemoglobin of petrol pump workers was significantly very low as compared to normal subjects. Similar trend was observed when petroleum attendants exposed to petroleum fumes for different duration were studied, that is hemoglobin decreases with years of experience of working at petrol pumps.



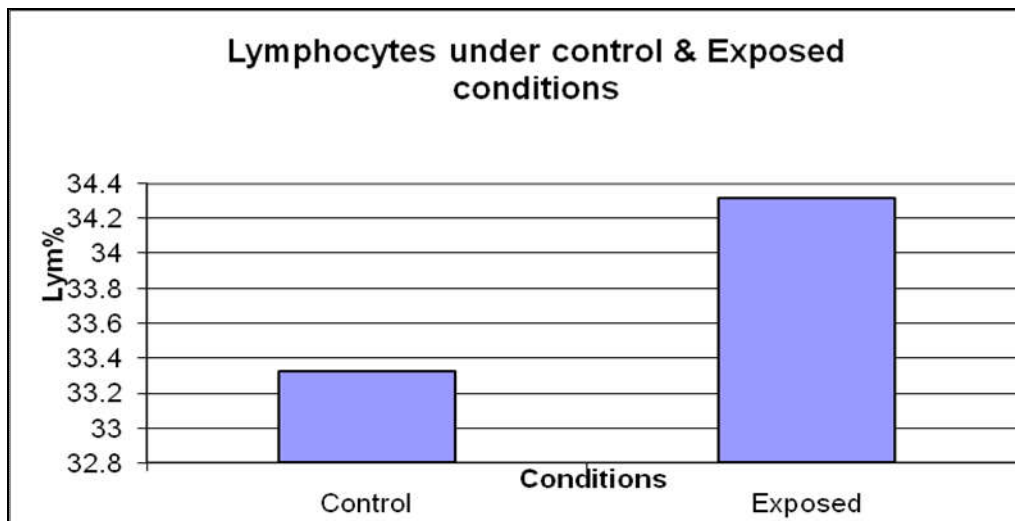
**Fig: 3. Comparison of hemoglobin of control and petrol pump workers with 6-10 years experience.**

**TLC (Total Leucocyte Count):** TLC was high in control group as compared to petrol pump workers but the difference was not significant. Insignificant variation was observed when different groups classified on the basis of duration of service in the petrol pumps were compared.



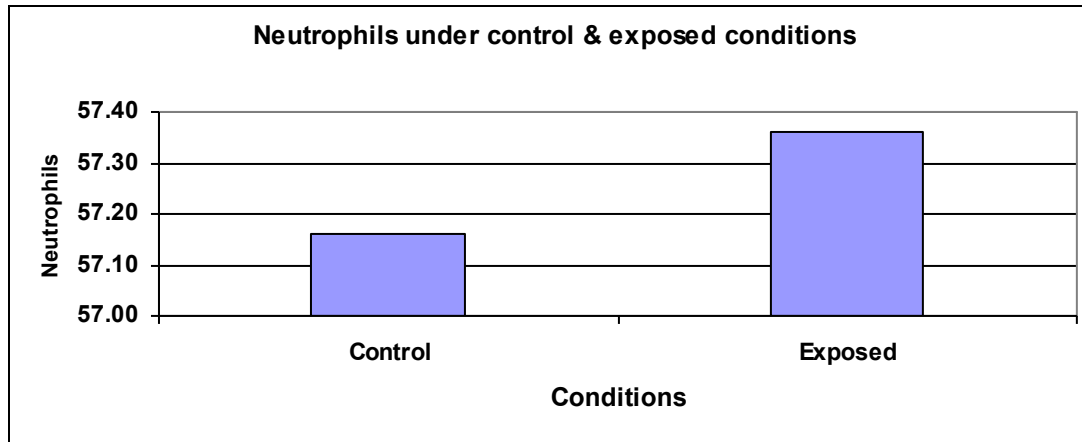
**Fig 4. Comparison of TLC of control and petrol pump workers with 6-10 years experience.**

**Lymphocytes%:** Lymphocyte percentage was low in control group as compared to petrol pump workers but the difference was not significant. Insignificant variation was observed when different groups classified on the basis of duration of service in the petrol pumps were compared.



**Fig. 5. Comparison of Lymphocytes of control and petrol pump workers with 6-10 years experience.**

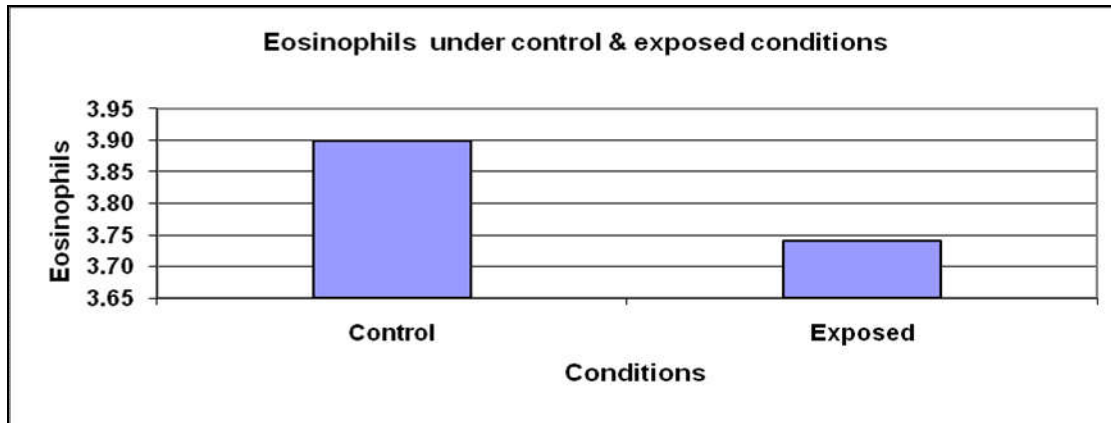
**Neutrophils%:** Neutrophils percentage was low in control group as compared to petrol pump workers but the difference was not significant. Insignificant variation was observed when different groups classified on the basis of duration of service in the petrol pumps were compared.



**Fig 6. Comparison of Neutrophils of control and petrol pump workers with 6-10 years experience.**

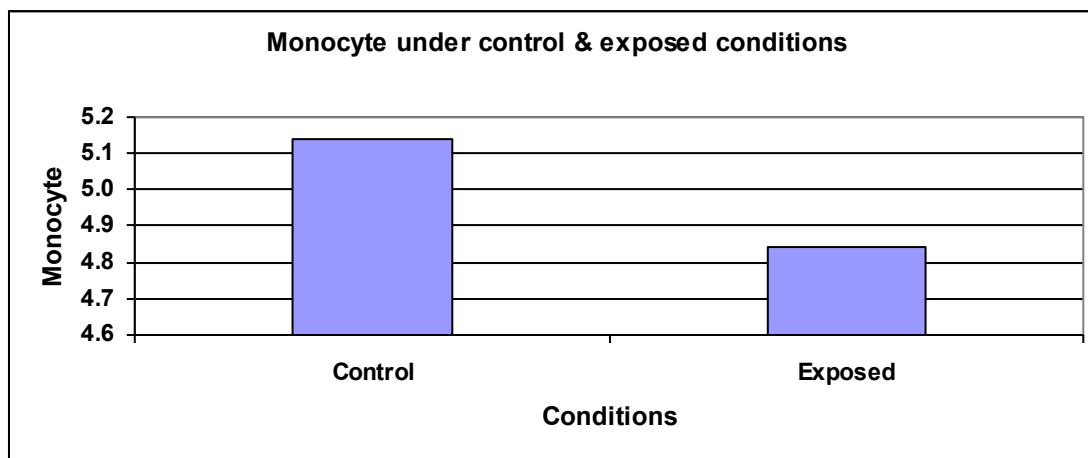
**Eosinophils Percentage:** Eosinophils percentage was high in control group as compared to petrol pump workers but the difference was not significant. Insignificant variation was observed when different groups classified on the basis of duration of service in the petrol pumps was compared.





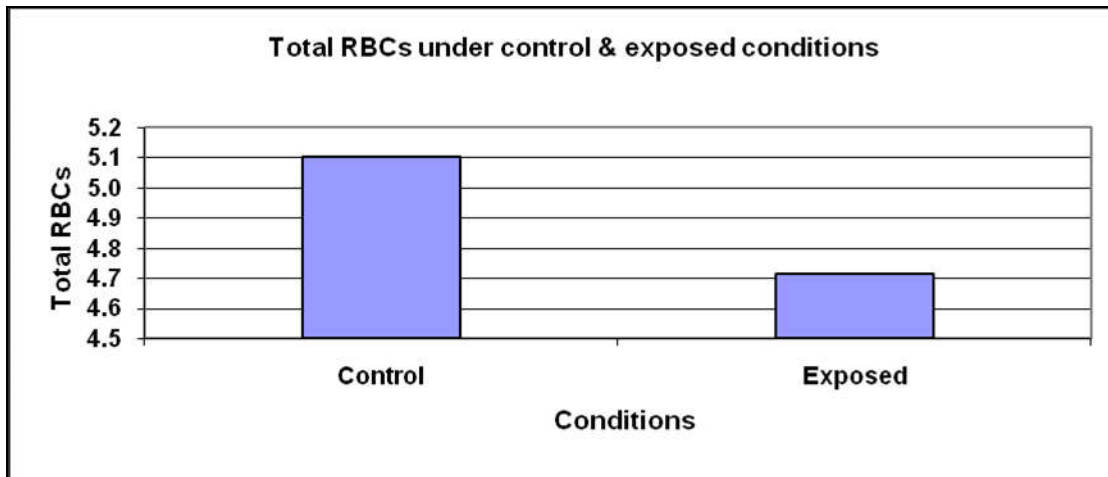
**Fig:7. Comparison of Eosinophils of control and petrol pump workers with 6-10 years experience.**

**4.7.3.6: Monocytes%:** Monocytes percentage was high in control group as compared to petrol pump workers but the difference was not significant. Insignificant variation was observed when different groups classified on the basis of duration of service in the petrol pumps were compared.



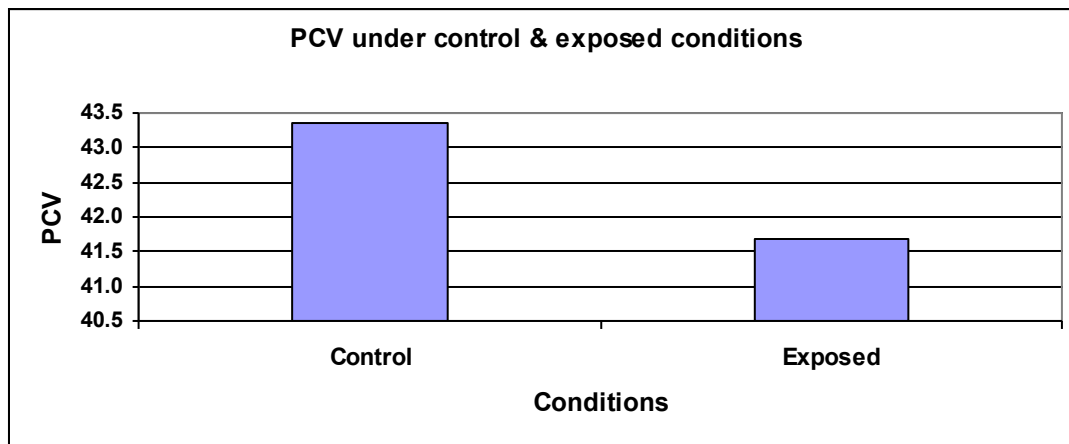
**Fig 8. Comparison of Monocytes of control and petrol pump workers with 6-10 years experience.**

**Total RBCs Count:** The level of total RBCs was significantly high in unexposed subjects as compared to exposed subjects, decrease in RBCs count was observed with increase in the years of service in the petrol pump. This is due to toxic effect of petroleum fumes on the bone marrow which decreases the synthesis of RBCs.



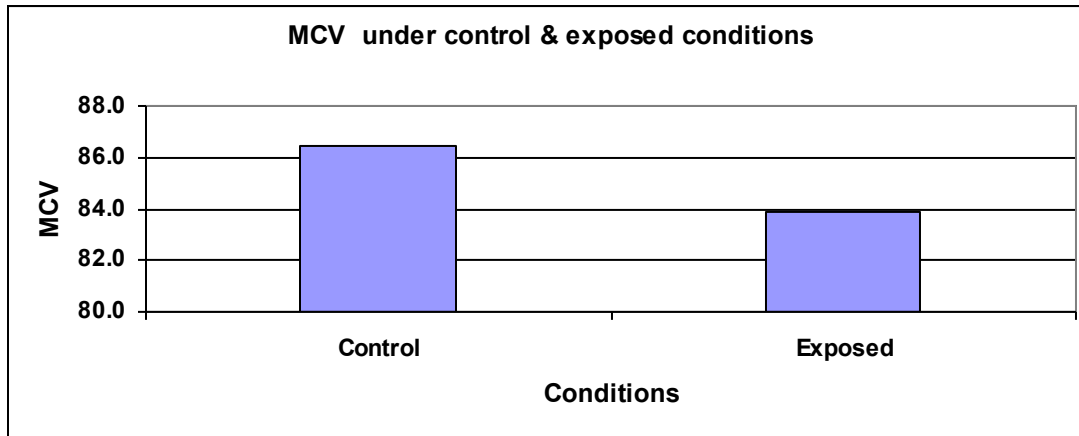
**Fig 9. Comparison of RBCs of control and petrol pump workers with 6-10 years experience.**

**PCV (Packed Cell Volume):** PCV was significantly high in unexposed group as compared to exposed group as PCV is the packed RBCs similar trend was obvious as of RBCs.



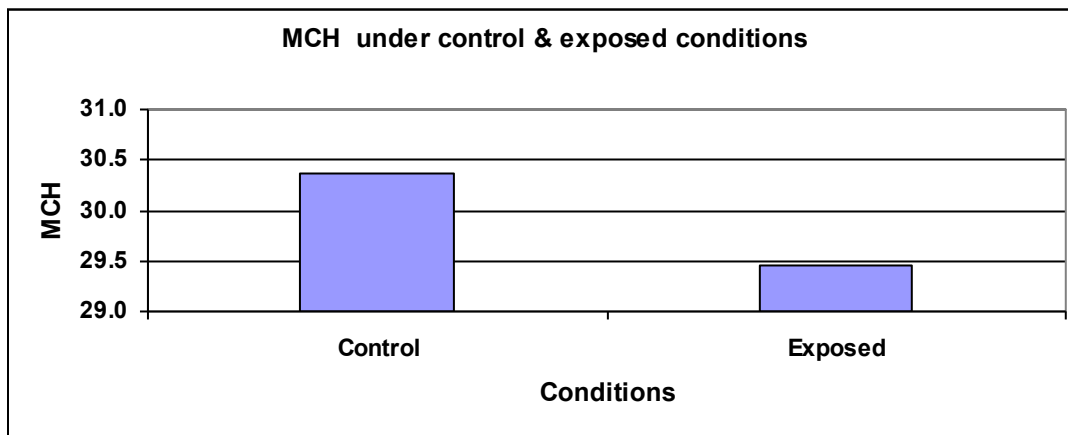
**Fig 10. Comparison of PCV of control and petrol pump workers with 6-10 years experience.**

**MCV (Mean Corpuscular Volume):** MCV was insignificantly high in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps.



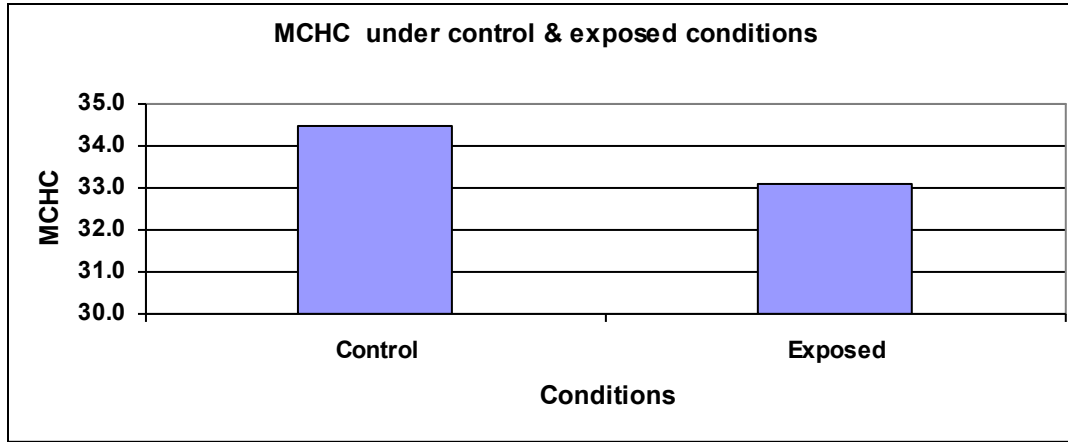
**Fig:11 Comparison of MCV of control and petrol pump workers with 6-10 years experience.**

**MCH (Mean Corpuscular hemoglobin):** MCH was insignificantly high in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps



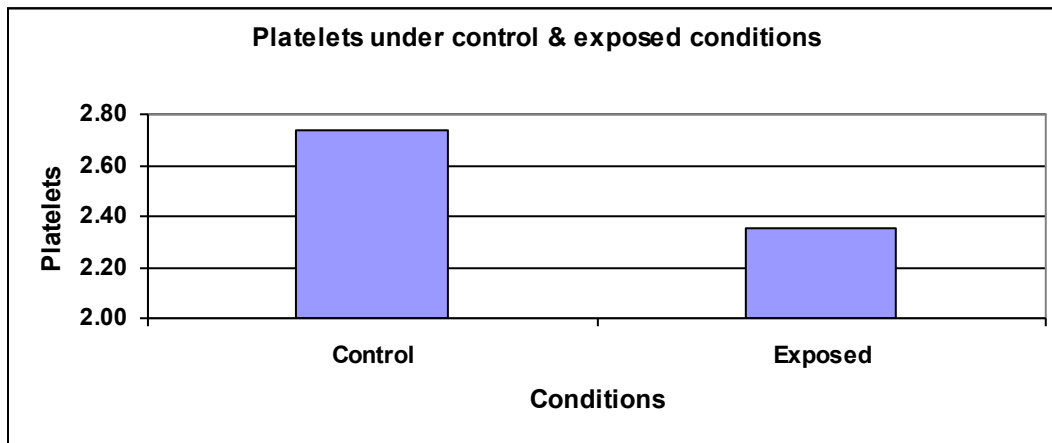
**Fig 12. Comparison of MCH of control and petrol pump workers with 6-10 years experience.**

**MCHC:** MCHC was significantly high in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps.



**Fig 13. Comparison of MCHC of control and petrol pump workers with 6-10 years experience**

**Platelets:** Platelets was significantly high in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps.



**Fig: 14. Comparison of platelets of control and petrol pump workers with 6-10 years experience**

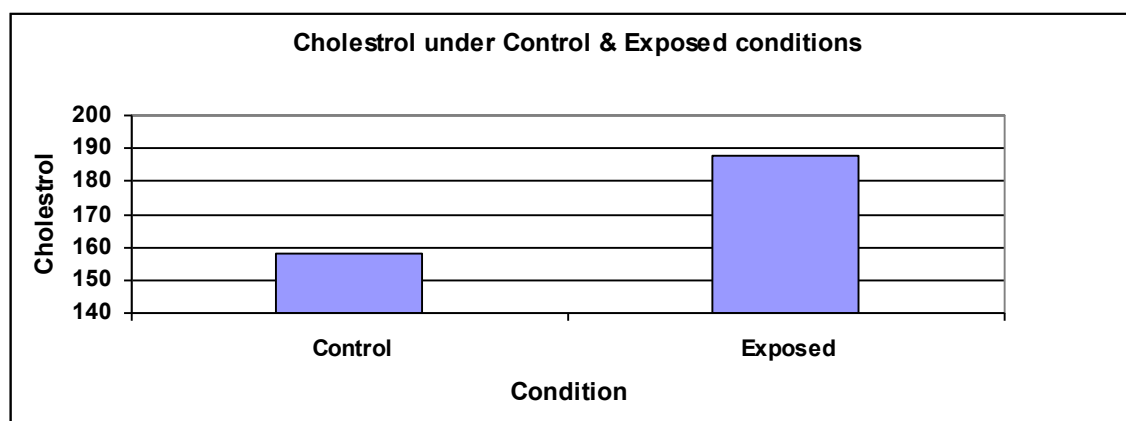
**Lipid Profile Analysis:**

**Table 3: Comparison of Lipid profile of control and petrol pump workers with 6-10 years experience**

| PARAMETERS | CONTROL | EXPOSED | LEVEL OF | CD |
|------------|---------|---------|----------|----|
|------------|---------|---------|----------|----|

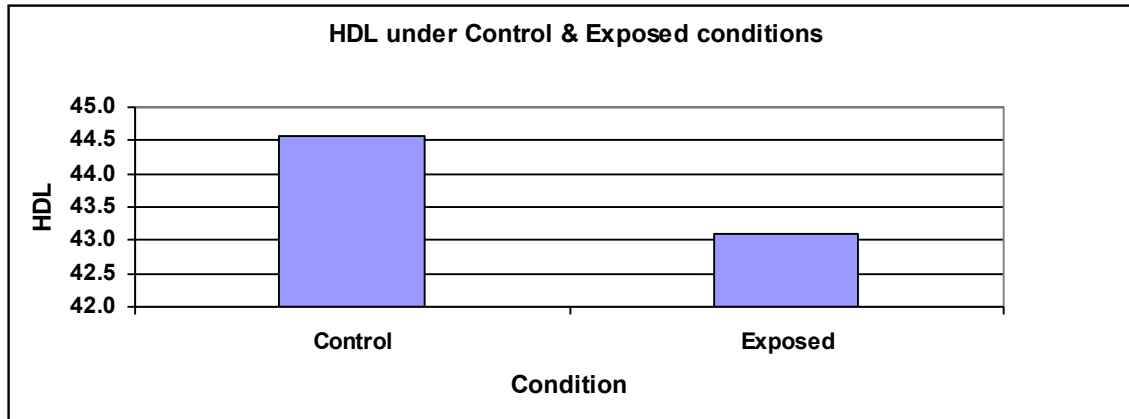
|                         |       |       | SIGNIFICANCE       |       |
|-------------------------|-------|-------|--------------------|-------|
| Cholesterol (mg/dl)     | 158.2 | 187.9 | ***( $p < 0.001$ ) | 13.35 |
| HDL Cholesterol (mg/dl) | 44.57 | 43.10 | NS                 | -     |
| Triglycerides (mg/dl)   | 137.4 | 168.9 | **( $p < 0.01$ )   | 20.87 |
| VLDL (mg/dl)            | 27.7  | 35.8  | ***( $p < 0.001$ ) | 4.09  |
| LDL Cholesterol (mg/dl) | 90.5  | 108.2 | ***( $p < 0.001$ ) | 12.07 |

**Cholesterol:** Cholesterol was significantly low in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps, that is increase of level of cholesterol due to increase in the level of increment in the service in petrol pump.



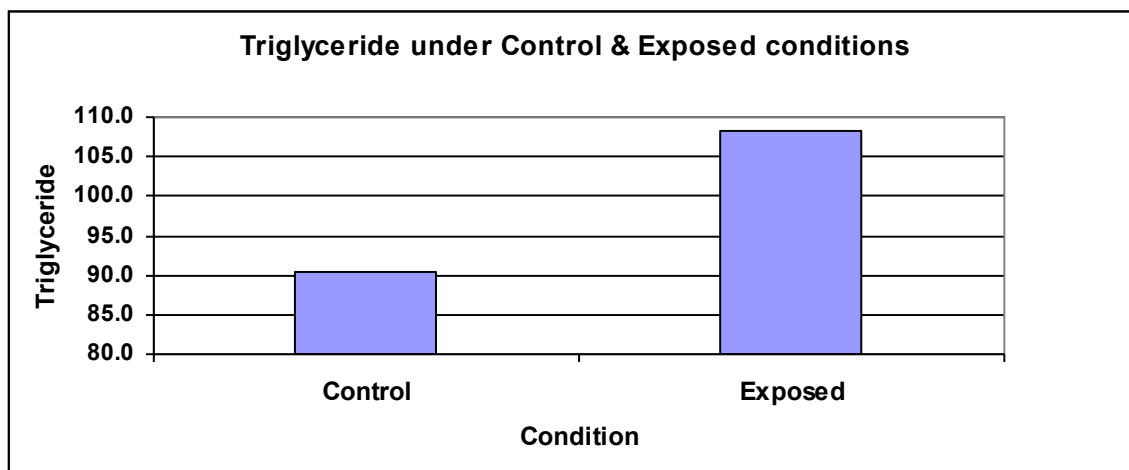
**Fig. 15. Comparison of cholesterol of control and petrol pump workers with 6-10 years experience**

**HDL cholesterol:** HDL cholesterol was significantly high in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps, that is decrease of level of cholesterol with decrease in the years of service in the petrol pump.



**Fig 16. Comparison of HDL cholesterol of control and petrol pump workers with 6-10 years experience**

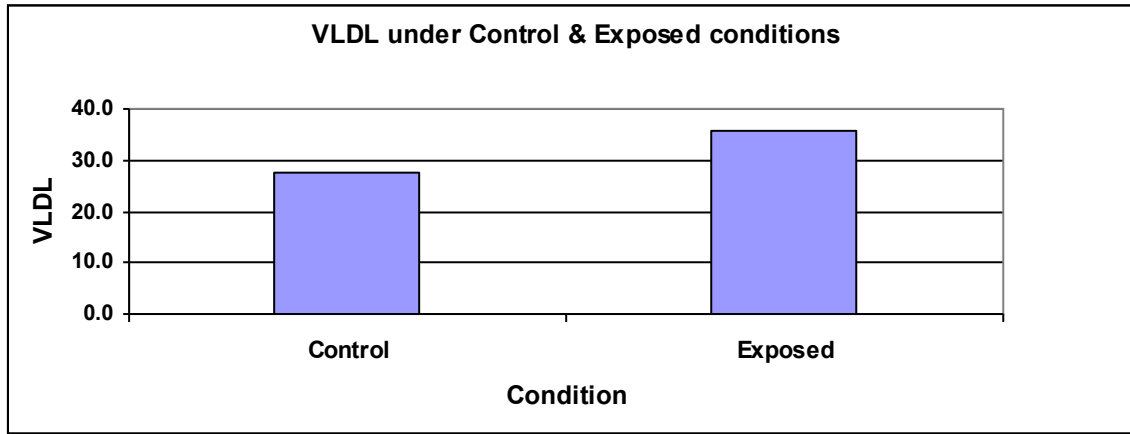
**Triglycerides:** Triglycerides was significantly low in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps, that is increase of level of triglycerides due to increase in the level of increment in the service in petrol pump.



**Fig 17. Comparison of Triglycerides of control and petrol pump workers with 6-10 years experience**

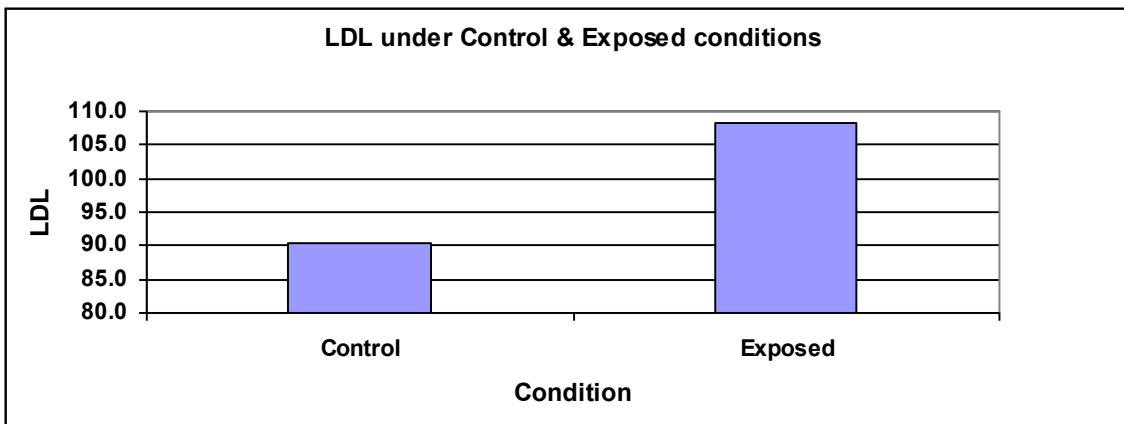
**VLDL Cholesterol:** VLDL cholesterol follows the similar trend as that of triglycerides, that is as it is calculated from triglycerides. The level of VLDL of petrol pump workers was significantly

very low in unexposed group when compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps.



**Fig 18. Comparison of VLDL of control and petrol pump workers with 6-10 years experience**

**LDL Cholesterol:** LDL Cholesterol was significantly low in unexposed group as compared to exposed group, similar trend was observed in different categories of petrol pump workers grouped on the basis of experience in petrol pumps, that is increase of level of LDL cholesterol due to increase in the level of increment in the service in petrol pump.



### **Fig 19. Comparison of LDL of control and petrol pump workers with 6-10 years experience**

#### **Conclusion**

The present study inferred the significant decrease in hemoglobin concentration, PCV percentage, RBC count, MCHC and platelet count with increase in years of exposure with petroleum vapours and insignificant change in TLC, Lymphocytes percentage, Neutrophils percentage, Eosinophils percentage, Monocytes percentage, MCV and MCH with increase in time duration spent in petrol pumps. Due to petroleum fumes there is chronic exposure which creates adverse effects on human hematopoietic system that leads to bone marrow depression and pancytopenia. The level of increase in total cholesterol, triglycerides, LDL, cholesterol and VLDL cholesterol with increase in years of exposure to petroleum products indicate altered lipid metabolism. This could bring about in cardiovascular risk in petroleum pump workers. Thus, more research is required to quantify the effect of gasoline on the health status of the petrol pump workers.

#### **References**

1. Norbert P., (1989). Evaluation of the health effects from exposure to gasoline and gasoline vapors. North East States for Co-ordinated Air Use Management, Final report.
2. Jorunn K., Trond R., Tore G.B., (2008). Effects of benzene on human hematopoiesis. *Open Hematol. J*; 2: 87-102.
3. Okoro A.M., Ani E.J., Ibu J.O., Akpohomeh B.A., (2006). Effect of petroleum products inhalation on some hematological indices of fuel attendants in Calabar metropolis, Nigeria. *Niger. J. Physiol. Sci*; 21(1- 2): 71-75.



4. Patel AS, Talbott EO, Zborowski JV, Rycheck JA, Dell D, XU X. Risk of cancer as a result of community exposure to gasoline vapours. Arch Environ Health. 2004 Oct; 59(10):497-503.
5. Mohammed Aleemuddin, M. Girish Babu, M.L. Manjunath and Shireen Swaaliha Quadri., (2015). Effect of chronic inhalation of petroleum products on hematological parameters Int. j. Curr.Res.Aca.Rev; 3(4): 196-201.
6. Pitarque M, Carbonell E, Lape-a N, MarsÃ; M, Valbuena A, Creus A, SCE analysis in peripheral blood lymphocytes of a group of filling station attendants. Mutat Res 1997; 390(1-2):153-9.
7. Renaud HJ, Rutter A, Winn LM. Assessment of xenobiotic biotransformation including reactive oxygen species generation in the embryo using benzene as an example. Methods Mol Biol. 2012; 889:253-63.
8. Li XZ, Hu XJ, Xia ZP, Xuan ZQ, Yang J, Wang J. [Detection of DNA damage of workers occupationally exposed to lead with flow cytometer assay]. Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi. 2009 May; 27(5):266-9.
9. Environ health perspect, Dec,1991; 104(6):1165-1171.
10. Brij Ind Med., Jul, 1991;48(7): 437-447.
11. Robertson G. leclercq I, Farrel GC Nanatco holic steatosis and sbeatopatith, cytochrome p. 450 enzymes and oxidative stress. Amj physical Gastrometabolism physiol, Zool, 281: 1135-1139.
12. Agency for toxic substances and disease Registry, Cas ID:71-43-2.S
13. Ohara, Y. T.E Peteson and D.G Harison, Hypercholesterolemia increase endolthelial superoxide an ion production. J. Clin. Invest, 1993; 91:2546-255.
14. Ubon, F.E.M.I. AK apanabiatu. I.J, Atan g who, P.E Ebang and I.B. Umoh, Effect of gasoline vapours on serum lipid profile oxidation stress on hepatocyter acta toxical, 2007: 15:13-18.

- 15.** Yamamoto T. and Wilson C.B.,(1987). Binding of anti-basement membrane antibody to alveolar basement membrane after intratracheal gasoline instillation in rabbits.Am.J. Pathol; 126: 497-505.